

Demystifying debris

Research shows that tyre faults such as impacts and cuts are occurring before trucks enter motorways. Bridgestone turns its gaze toward the depot

Tyres play a vital role in ensuring our safety on the roads but damage to them can have disastrous consequences. In 2016, information from Highways England's (now branded National Highways) released figures showed that 32 people were killed or seriously injured in motorway road traffic accidents due to illegal, defective or underinflated tyres. Subsequently, the highway authority teamed up with Bridgestone to conduct an 18-month study of damaged motorway tyres and tyre fragments.

The Bridgestone Tyre Debris Study Report 2015-2017 included an analysis of 1,035 samples of failed tyres provided by Highways England (as it was then known) from four inspection sites.

The results showed that tyres damaged by road hazards (impacts, penetrations and cuts) accounted for 56% of the total tyres (1,035 tyres) inspected. What's more, 64% of those were found to have at least one penetration.

But the lack of debris on National Highways' managed

roads prompted questions about the source of the debris. If it cannot be found on the motorway, where is it coming from?

ANOTHER PLACE

Bridgestone has now published a new report, Fleet Debris Study 2022 - 2023, which investigated a new source of debris: depots. It studied the distribution of debris such as bolts and nails in depots, near vehicles, offering evidence that they are getting picked up by tyres, gradually working their way into the tread or casing, leading to punctures down the road.

For the study, five unnamed fleets operating in transportation, waste recycling, management, food and manufacturing each agreed to grant access to a single depot (with the greatest number of damaged tyre removals) for inspection and debris collection. Each depot is adjacent to major motorways: Depot 1- (M6, M54, A460, A5 and A34; Depot 2 - A374,

A379 and A386; Depot 3 - A74(M), A6 and A386); Depot 4 - M6, M42, A452 and A45; and Depot 5 - M5, M4 and M38.

The inspection classified debris based on its likelihood of causing a penetration, and their proximity to fleet vehicles. The puncture risk and severity depends on factors such as size, mass, presence of sharp edges, type of material (metal, wood or glass). Based on these factors, the debris samples collected were classified as:

- **HIGH RISK:** Debris objects with high risk of causing penetration or puncture to a tyre such as bolts, large nails, screws, etc.
- **MEDIUM RISK:** Debris objects with medium risk of causing penetration or puncture to a tyre such as steel wire hooks, small nails, large wood chips, sharp edged metal objects, etc.
- **LOW RISK:** Debris objects with low risk of causing penetration or puncture to a tyre such as washers, nuts, pins, etc.



“Instructing drivers to inspect the hard standing for debris in the immediate vicinity of the parked vehicle at fleet depots, in addition to just scanning the tyres alone for debris, can reduce the risk”

©iffiStudio - stock.adobe.com

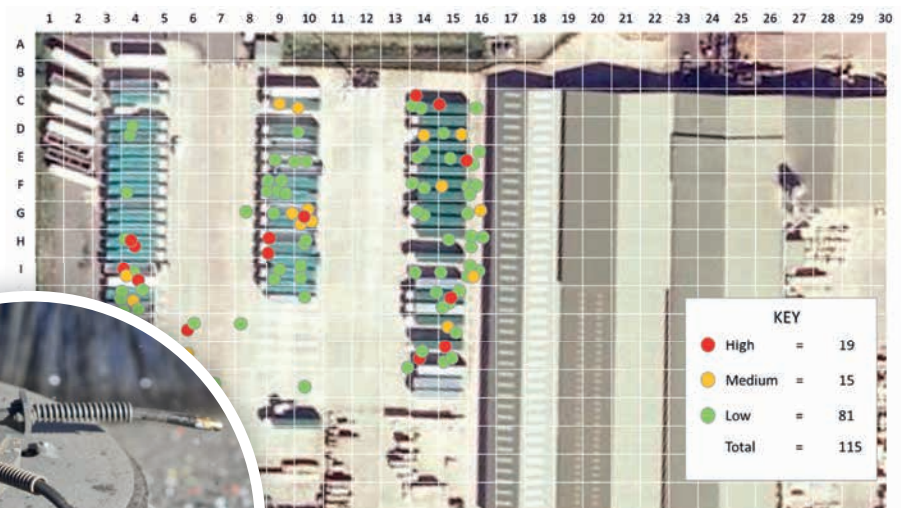
The researchers found a total of 102 high-risk items and 98 medium-risk items. In addition, 304 low-risk items were also collected.

MAPPING RESULTS

Bridgestone mapped the location of the debris using a Google Maps overhead satellite photo. The layout of each depot was further divided into equally spaced-specific quadrants. High-risk debris items were marked with a red dot; medium-risk items with orange and low-risk items with a green dot. This created a debris heat map (pictured, right).

The heat map helped to identify specific areas where debris tended to accumulate. Results are discussed by depot in more detail:

- Depot 1 and Depot 3 had debris accumulated in the vehicle washing areas that are frequently visited by all fleet depot vehicles. Debris found in these areas included automotive fasteners such as bolts, screws, washers and nuts. These debris items could be the result of parts becoming dislodged as they are washed. However, Depots 2, 4 and 5 did not; debris accumulation near vehicle washing areas tends to, therefore, vary from depot to depot.
- Depots 1, 3 and 5 also had considerable amounts of debris at loading bays, another high-traffic area. Drivers manually sweeping debris such as pallet fasteners (screws, nails, etc) on to the loading areas instead of properly disposing of them could be one of the reasons for debris accumulation in these areas. Depot 2 and Depot 4 did not have loading and unloading bays.
- Depot 2 and Depot 5 also accumulated debris in the areas used for vehicle maintenance and servicing.



Debris included automotive fasteners, indicating that these items were not disposed of correctly after the vehicles were serviced.

- Depot 4, a wooden object-based recycling operation, had a high concentration of high-risk debris items in the areas adjacent to where a debris pile-up of bolts, nails, rivets and screws was noted during the day of inspection. The pile-up refers to a sectioned off area that was used to discard all the debris that had been collected from other areas in the depot.

ARE SWEEPERS THE SOLUTION?

The report recommends the use of a road sweeper at all depots as a precautionary measure. An analysis of the heat map indicates that those depots that used a brush sweeper (2 and 5) or a magnetic sweeper (Depot 4) removed almost all debris found on the concrete roads or pathways and parking areas. The team hopes to carry out further research to measure systematically the impact of the use of a road sweeper on tyre failure rates.

In addition, analysis of the debris heat map indicated that the vehicle washing, loading/unloading and servicing areas are three regions where debris tends to accumulate. A visual inspection of the depot with careful scrutiny of these locations can prevent debris build-up.

Finally, the report highlights the importance of driver walk-around checks, which require all drivers to ensure that the tyres are free of any debris, prior to commencing their journey. Instructing drivers to inspect the hard standing for debris in the immediate vicinity of the parked vehicle at fleet depots, in addition to just scanning the tyres alone for debris, can reduce the risk of penetration from fleet depot debris. [TE](#)

TYRES AND SAFETY

The role that tyre failures have to play in crashes cannot be underestimated. The latest Department for Transport Reported Road Casualties GB report stated that 419 of the 1,759 personal injury collisions recorded in 2021 were because of defective or illegal tyres. In total, 418 people were killed or seriously injured because of incidents where vehicle defects were identified. Of those, 111 were due to tyres alone.